GOOD AS GOLD

Recovery of Gravel From Lake Bottoms

By JOHN JEFFERSON, C. E. '27

The Morristown, Indiana plant, with which this article deals, is one of four washing and screening plants near Indianapolis operated by the author and his brother, C. E. Jefferson, C. E., '17. While in school, John H. Jeffersson served on the staff of the Ohio State Engineer, and has always kept in touch with its progress. Very recently he contributed an article to PIT AND QUARRY, *the national magazine of the non-metallic industries. We are indebted to that magazine for the cuts used in this article.*—EDITOR.

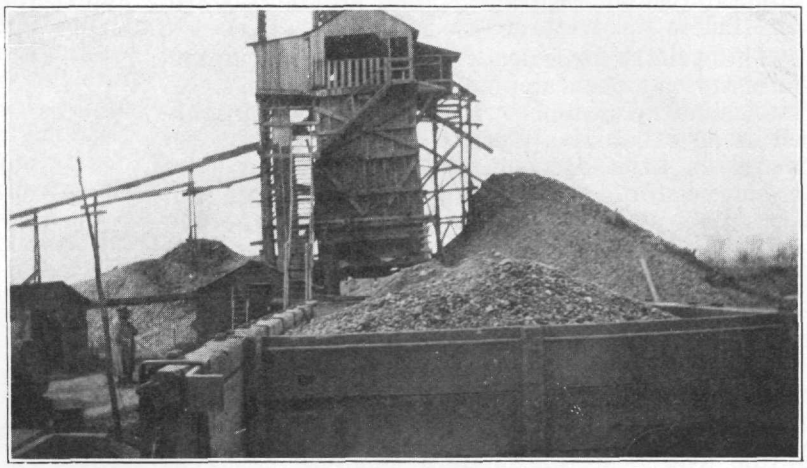
THERE are those who claim that our present civilization is on the decline, but observations and statistics seem to point to a more optimistic view. One does not travel very far, by rail, automobile, or even on foot, without noticing the forward trend of the times, at least from the standpoint of building.

If in a city we perhaps see, here a great hotel under construction, there an office building or factory nearing completion, or if in the residential district, numerous homes are being erected. In the country we travel over modern hard surfaced pavements and cross bridges which span small streams and great rivers.

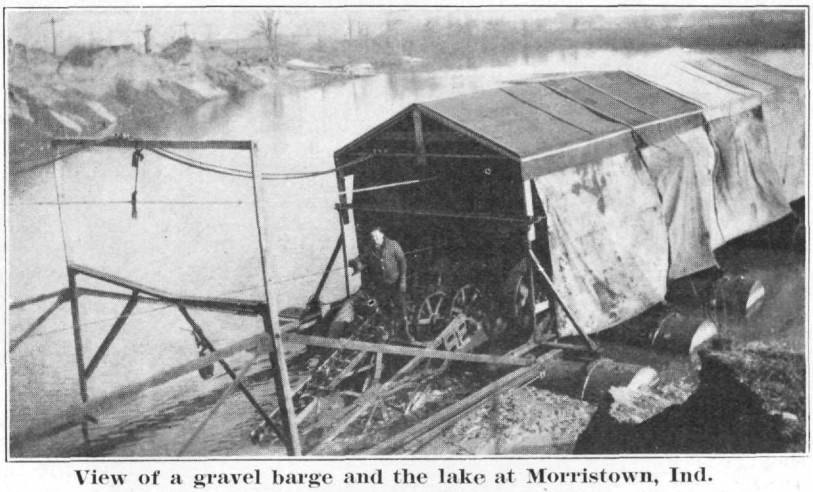
All these building projects necessarily indicate activities in the various industries which are engaged in producing the materials which are used in modern structures. Not least among these may be numbered sand and gravel, which play an important part in all phases of concrete construction.

Nature has provided abundant supplies of gravel in some localities, especially those covered with glacial drift. Many terminal moraines contain very good deposits of sand and gravel, while river valleys and stream beds furnish other sources of supply. Some moraines are easily distinguished by their shape, but the height of others is so slight that they are hard to recognize. The thickness of the overburden of earth above the gravel is often so great as to render the deposit uneconomical for development. However, in stream beds the water action frequently carries away the covering strata of earth and leaves the gravel deposited in banks or bars.

These bars and pits in glacial deposits furnished adequate gravel for early uses, but later needs necessitated a more rapid method of reclaiming material, and also a better quality than the "pit run" grade. With the increasing popularity of concrete, came specifications requiring cleaner materials for the aggregate and the proper proportion of the correct sizes



Trainload of ballast in hopper bottom, center dump cars



View of a gravel barge and the lake at Morristown, Ind.

Bucketful of gravel taken from lake; also plant employees

to be used. To meet these requirements, the team and wagon method of removal has been supplemented by various types of plants for reclaiming the material and preparing it for market. Some plants use a steam shovel to recover material from deposits which are largely above water level. Barges reclaim gravel from the channel of some navigable streams. It is washed and screened and unloaded into bins for local delivery or into cars for shipment. Power scrapers, which deliver the material to a belt conveyor or bucket elevator system, are in use at some plants. The slackline cableway excavator is extensively used in the industry, because of ease of installation and adaptability of recovering material both above and below the water level.

The writer's experience in the sand and gravel industry has been at plants equipped with slackline cableway systems. This article is not intended as an exhaustive treatise on the industry, but merely a brief description of the journey of a cubic yard of gravel through a washing and screening plant. Ordinarily material for publication in an engineering magazine contains numerous curves and tables of B. T. U.'s, E. M. F's, P. T.'s, H. I.'s, bending moments, etc., so this grit may seem out of place. However, one of Prof. Sherman's definitions of engineering used to run something like this—"directing the forces and materials of nature to the uses and conveniences of man." So we'll take a chance that this definition will cover this phase of engineering as an industry.

One of the plants of the Granite Sand and Gravel Company is located at Morristown, Indiana, 25 miles southeast of Indianapolis on the Indianapolis and Cincinnati traction line. The gravel occurs in a glacial deposit and extends from about 15 feet above to 20 feet below the water level. The material runs from 40 per cent to 50 per cent above the quarter inch. It is removed from the deposit with a one yard shearer and Mayer bucket operating on a Sauerman slackline cableway of 650 foot span. A one three-eighths inch wire rope trackline is anchored to a bridle hitch on the back side and to a pair of triple blocks attached to the top of an 80 foot hickory mast pole at the plant. The gravel is dumped into a receiving hopper through a set of grizzly bars spaced on 4-inch centers. These bars are placed on a 45 degree slope and automatically reject the oversize boulders onto a waste pile. A gate in the bottom of the hopper feeds the gravel into a Stocker (patent) rotary, water drum washer. Clean water is forced in at the gravel discharge end and causes the dirty water and sticks, if any, to be washed out at the feed end of the washer into a waste trough.

End view showing bucket dumping gravel into hopper

The washing drum is 5½ feet in circumference and 12 feet in length. Longitudinal vanes, on the shell of the washer, lift the gravel out of the water as the drum rotates and permit it to fall into the water again as each vane passes the top of the circumference. The gravel falls into a series of stationary conveyor pans placed on a 30 degree angle longitudinally through the center of the washing drum. In passing over these pans, it moves forward about 18 inches per drum revolution. Thus the material is washed at least 8 times on its trip through the washer.

The gravel is discharged onto a conical screen which is attached to and revolves with the washer. Surrounding the gravel screen is a sand screen with one-fourth inch round openings. A 2 inch stream of water forced through a series of small nozzles completes the washing of the gravel and separates the sand from the coarse aggregate. The screened gravel falls into one bin and the sand runs through a chute into another bin. When a finer sand is desired for plastering or brick work, the sand is re-screened over a gravity screen. A water jet forces the fine sand through the screen into a settling tank and washes the grit off into another chute. The settling tank removes the excess water from the sand.

The oversize gravel which does not pass through the screens, automatically feeds into a Telsmith jaw crusher placed at the mouth of the screen. One of the crusher jaws is stationary while the other is hinged at the top, and the bottom works back and forth on an eccentric bearing. As the other, no material can pass through the crusher jaws are placed V-shaped in relation to each until it is reduced to the size of the opening at the bottom of the jaws. The crushed gravel falls into the bin with the screened gravel. By means of a system of troughs and chutes, the sand and gravel may be mixed in any desired proportion and run into any one of the bins into which the storage portion of the plant is divided. The bins are of timber construction reinforced with steel rods. The storage capacity is about 200 cubic yards. The plant, which is of the center bottom discharge type is constructed over the switch-track, and the cars are backed under the various bins for loading.

Electricity is used for power for all the plant operations. It is 3 phase, 60 cycle, A. C. stepped down from 33,000 volts to 440 volts, by a set of transformers, on the location. A 75 H. P. motor runs the Thomas 2 drum, 2 speed belt driven hoist. Water is supplied from a 45 foot driven well by a 5-inch American centrifugal water pump, operated by a 25 H. P. motor. The discharge head at the washer is about 48 feet. A

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PAGE THE COGNOSCENTI

She: "Have you read 'Finis'?"
He: "No, what is it?"
She: "It's the last word in books."

THE AGE OF INNOCENCE

Photographer: "Watch, and you'll see a pretty little dicky bird come out."

Modern Child: "Oh, don't be an ass—expose your plate and let's get this over with!"

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20 H. P. motor drives the washer, while one of the same size runs the crusher.

A large percentage of the output from this plant is sold for road construction and maintenance purposes. It is shipped on the T. & C. traction in 12 and 16 yard capacity Western side dump cars and delivered at any point along the line. As this line crosses highways at about one mile intervals, the team or truck haul is reduced to a minimum.

A portable steel barge with a 10-inch American Manganese Steel Company centrifugal pump reclaims gravel from the remote sections of the lake beyond reach of the cableway. The gravel is pumped through the pipe line and discharged into the lake near the plant where it can be picked up with the bucket. The pump is equipped with a 40-foot Swintek traveling suction screen, which loosens the gravel and removes the oversize boulders from in front of the suction nozzle. The pump is belt driven by a 200 H. P. motor.